NOTES ON THE FERN GENUS ERIOSORUS

ALICE F. TRYON

Eriosorus Fée was taken up by Copeland (Genera Filicum, Chronica Botanica, Waltham, Mass. 1947) for the older, much used name, *Gymnogramma*. Several of the species are transfered with the explanation, "both *Gymnogramma* and *Neurogramma* have the same type species as *Gymnopteris* and are thus synonyms". *Gymnogramma* is a synonym of *Gymnopteris* but it must pass from botanical usage more precisely because it is superfluous (Internat. Code Bot. Nomencl., Montreal 1961, Art. 63). *Gymnogramma* Desvaux (Ges. Naturf. Freunde Berlin Mag. 5: 304. 1811) included *Acrostichum rufum* L. (*Gymnogramma rufum* (L.) Desv.). However, Bernhardi had previously based *Gymnopteris* (Jour. Bot. Schrader **1**: 297. 1799) on *Acrostichum rufum* L.; thus Desvaux's name is illegitimate because it included the type of Bernhardi's earlier name. Since *Gymnogramma* is superfluous its type is the same as that of *Gymnopteris* (Art. 7, note 4).

Kuhn (Fests. 50 Jub. Reals Berl. (Chaetop.) 1882) proposed the name *Psilogramme* for these species and he was followed by Underwood (The genus *Gymnogramma* of the Synopsis Filicum, Bull. Torrey Club **29**: 617-634. 1902) and Maxon (North American species of *Psilogramme*, Bull. Torrey Club 42: 79-86. 1915) neither of whom referred to the earlier name, *Eriosorus*.

Copeland considers *Eriosorus* a "very natural genus of about 35 species, all tropical American, mostly Andean" but includes only a partial list of 14 species. The following new combinations and new species are added to these. These new names are published here for use in a treatment of the genus in Peru in which the species are illustrated.

Eriosorus Orbignyanus (Kuhn) comb. nov.

Gymnogramma Orbignyana Mett. ex Kuhn, Linnaea **36**: 70. 1869.

Eriosorus Lechleri (Kuhn) comb. nov.

Gymnogramma Lechleri Mett. ex Kuhn, Linnaea **36**: 71. 1869.

Eriosorus rufescens (Fée) comb. nov.

Gymnogramma rufescens Fée, Gen. Fil. 181, to. 19C, f. 3. 1852.

Eriosorus Stuebelii (Hieron.) comb. nov.

Gymnogramma Stuebelii Hieron. Hedwigia **48**: 219, t. 9, f. 5. 1909.

Eriosorus accrescens A. F. Tryon, sp. nov.

Rhizoma ignotum, folia subscandentia (vel pendentia ?), laminae elongato-lanceolatae vel elongato-ovatae, bipinnato-pinnatifidae vel tripinnatae, apex indeterminatus gemma tomentosa fulva vel straminea, rhachis modice flexuosa, pinnae deltoideae subcoriaceae petiolulatae, pinnulae deltoideae vel ovatae adaxialiter et abaxialiter fulvosericeae, nervis marginem attnigentes ad terminos flabellatis, sporae obscure fuscae.

TYPUS: PERU, DEPT. CUZCO, PROV. URUBAMBA, Puyupata — "Yuncapata", *C. Vargas* 2921 (US); PARATYPI: DEPT. CUZCO, Huadquiña, *Bües* 992 (US), Valle de Lares, Montaña de Colca, *Bües* 1925 (US), Altura de Chaco, *Bües* 2135 (US).

Petiole probably shorter than the lamina (specimens incomplete), atropurpureus, terete, plane or slightly channeled on the upper surface near the apex, slender, less than 1/2 the diameter of the rachis, pubescent with tan, patent trichomes. Lamina 15-30 cm. long, 8-15 cm. wide. Rachis castaneus becoming lighter colored toward the apex, terete, plane or channeled on the upper surface, tomentose, the trichomes tan, acuminate. Pinnae stalks ca. 1.0 cm. long. Ultimate segments bluntly lobed to crenulate, somewhat more densely pubescent on the lower surface along the veins, the trichomes tan, multiseriate with acuminate apex. Margin with a border of clear, linear cells. Spores triangular-globose, the equatorial wing broad, sometimes lobed, the 3 angles slightly protruding, the proximal face with ridges or papillae adjacent to the commissural ridges, the distal face with 3 contiguous ridges forming a triangle.

These specimens from Cuzco, although incomplete, are quite distinct from other species in having leaves with a large, tan, tomentose apical bud and stalked pinnae with soft, tan pubescence. They most closely resemble *E. aureonitens*, especially in the form of the bud, but in that species the leaves are more slender and densely covered with a bright, rust colored tomentum. Several other species also have sustained growth from the leaf apex but have smaller buds. The habit of the leaves is difficult to determine from the specimens but is either somewhat climbing or hanging, for the very slender petiole could not support the lamina.

All of the specimens are from the Urubamba valley, north of Cuzco, from 3000-3350 m.

GRAY HERBARIUM, HARVARD UNIVERSITY.

CONTRIBUTIONS TO AN ILLINOIS FLORA I. THE GENUS PHYSOSTEGIA

ROBERT H. MOHLENBROCK

Linnaeus' (1753) *Dracocephalum* included species now known to belong to more than one genus. Two groups of Illinois plants belong here. One usually has been called *Dracocephalum*, the other *Physostegia*. Nearly a score of years ago, there was considerable effort on the part of some botanists to consider Linnaeus' *Dracocephalum virginianum* the type for the genus. This would have caused all Physostegias to be placed in *Dracocephalum*, and would have required the other Dracocephalums to be known by Adanson's revived name *Moldavica*. Gleason (1952) has followed this plan.

Fortunately, to avoid confusion, *Dracocephalum*, based on *D. moldavica* L., has been conserved under provisions of Article 14 of the International Code of Botanical Nomenclature (1961) so that *Physostegia* may still be retained for American species generally known by that name in the past.

Jones (1945, 1950) and Jones, Fuller, *et al.* (1955) consistently have recognized only two species in Illinois. They list *Physostegia speciosa* and *P. virginiana*. They relegate *P. angustifolia* to synonymy under *P. virginiana*. This writer during this study has found sufficient evidence to justify the maintenance of Fernald's *P. angustifolia* as a distinct species. Neither *P. intermedia* nor *P. parviflora* is treated in Illinois by Jones (1945, 1950) and Jones, Fuller, *et al.* (1955), although Gleason (1952) attributes the former to Illinois and Fernald (1950) the latter. Both species were found to be present in Illinois in this study.

Physostegia, because of its exserted stamens, of which the upper pair is shorter than the lower, generally is classified in tribe Stachydeae of the subfamily Stachydoideae. The genus is phylogenetically close to the monotypic *Synandra*, but this latter genus possesses one nearly suppressed calyx lobe and anthers which are brought into contact due to incurving of the filaments. The name *Synandra* refers to the "united anthers."

Various authors have accorded different treatments to the genus. Fernald (1950) recognizes 7 species and 2 varieties over the same area for which Gleason (1952) lists merely 5 species. Further confusion has been brought about by the transfer of species to the genus *Dracocephalum*.

The most valid characters to be used in distinguishing species are leaf size and shape, leaf margin, bracteal development, and calyx structure. Less important characters are corolla size and color and length and arrangement of the inflorescence.

LEAF SIZE AND SHAPE. Although size and shape of leaves are generally unreliable diagnostic characters, they seem to stand up well in the separation of the species of *Physostegia*. Size is particularly important in the segregation of *P. angustifolia*, for it is the only species which always has all its leaves 1 cm. broad or less. Shape is invaluable in distinguishing *P. parviflora*, for it is the only species with the uppermost leaves rounded at the base. Neither leaf length nor leaf apex offers any reliable characters.

LEAF MARGIN. *Physostegia virginiana*, *P. speciosa*, and *P. angustifolia* have coarsely serrate margins in which the teeth are frequently incurved-acerose. The teeth of *P. parviflora* are generally small and not acerose, while the margin of *P. intermedia* is repand or undulate. Some deviation from these general patterns exists, but for the most part the character of the leaf margin is useful.

BRACTEAL DEVELOPMENT. Perhaps the most conspicuous difference among the species of *Physostegia* is bracteal development. In *P. speciosa* and *P. parviflora* there is a gradual transition from the larger lower cauline leaves to the upper cauline and bracteal leaves; in the other species, there is an abrupt demarcation in size between the lower and upper leaves. The bracteal leaves may be reduced without reduction in size of teeth and thereby appear pectinate. In *P. virginiana*, the bracts may be entire.

CALYX STRUCTURE. Several characters of the calyx may be useful in distinguishing the species. The calyx is always densely glandular in *P. virginiana*, eglandular in the others.

It ranges in length from 3-6 mm. in *P. intermedia* to 5-10 mm. in *P. virginiana.* Considerable overlapping of calyx lengths occurs, however. The relative lengths of the calyx teeth and tube are significant. The teeth are nearly one-half as long as the tube in *P. intermedia,* one-third as long in *P. virginiana* and *P. parviflora,* and two-fifths as long in *P. speciosa* and *P. angustifolia.*

COROLLA SIZE AND COLOR. The corolla is usually 2-3 cm. long in *P. virginiana* and *P. angustifolia* and only slightly smaller in *P. speciosa;* in *P. parviflora* and *P. intermedia,* the size range is 1.0-1.7 cm. long. Color of the corolla varies from all shades of purple to nearly white.

INFLORESCENCE. The inflorescence ranges in length from 5-35 cm.; it is shortest in *P. intermedia.* The spikes may be slender and interrupted *(P. intermedia* and *P. angustifolia)* or more robust and continuous in the other species; they may be stiffly erect or arched-ascending.

ECOLOGY AND DISTRIBUTION OF THE SPECIES

The species of *Physostegia* in Illinois occur in moist open areas. Collectors usually refer to these habitats as swales or low prairies. *Physostegia virginiana* seems to show a somewhat wider tolerance in the moisture requirement.

The five Illinois species of *Physostegia* exhibit three general distribution patterns. *Physostegia virginiana* and *P. speciosa* are eastern species generally ranging from New England to the Dakotas; *P. virginiana* extends south to the Gulf of Mexico, while *P. speciosa* reaches only Missouri, Tennessee, and the Carolinas. *Physostegia angustifolia* and *P. intermedia* are midwestern, occupying an area roughly bounded by Kentucky, Kansas, Mississippi, and Texas. *Physostegia parviflora* is northwestern, ranging from Minnesota and Indiana to the Pacific Ocean.

In Illinois, *Physostegia virginiana* and *P. speciosa* are locally abundant throughout the state. *Physostegia angustifolia* is fairly common, but thus far confined to the northern three-fourths of Illinois. Our most southern records are from St. Clair and Marion Counties. *Physostegia parviflora*

and *P. intermedia* are rare, the former known from Adams County, the latter from Lake and Lee Counties.

The distributional data recorded in the paper are the results of study of all material in the following herbaria: University of Illinois, Illinois Natural History Survey, Illinois State Museum, Missouri Botanical Garden, Southern Illinois University.

SYSTEMATIC TREATMENT

Physostegia Benth. Lab. Gen. & Sp. 504. 1834.

Dracocephalum L. Sp. Pl. 594. 1753, pro parte, non nom. conserv.

Rather stiffly erect, branched or unbranched, perennials with glabrous stems and leaves; leaves alternate, simple, serrate, dentate, undulate, or rarely nearly entire, usually becoming reduced near the inflorescence; inflorescence terminal, spicate, simple or compound; flowers large, showy, purplish to whitish; bracts small, each bearing one flower; calyx campanulate or tubular, regular, pubescent, 10-nerved, slightly enlarging in fruit, the lobes deltoid; corolla tubular, bilabiate, with a dilated throat, the upper lip erect, emarginate to entire, the lower lip spreading, 3-lobed; stamens 4, the lower pair longer and ascending under the upper lip of the corolla; nutlets smooth.

Key to the Illinois Species of *Physostegia*

1. Leaves more or less undulate ..... 1. *P. intermedia*
1. Leaves definitely serrate.
   2. Leaves (at least the upper) broadly rounded at base, the teeth rarely more than 1 mm. long; corolla rarely longer than 1.5 cm. ..... 2. *P. parviflora*
   2. Leaves cuneate or subcuneate at base, the teeth regularly more than 1 mm. long; corolla 1.5-3.0 cm. long.
      3. Upper leaves abruptly reduced in size; spike appearing pedunculate.
         4. Broadest leaves never exceeding a width of 1 cm.; flowers remote ..... 3. *P. angustifolia*
         4. At least some of the leaves over 1 cm. broad; some of the flowers overlapping ..... 4. *P. virginiana*
      3. Upper leaves gradually reduced in size; spike appearing sessile ..... 5. *P. speciosa*

1. *Physostegia intermedia* (Nutt.) Engelm. & Gray, in Boston Journ. Nat. Hist. 5:257. 1845.

Dracocephalum intermedium Nutt. in Trans. Am. Philos. Soc. 5:187. 1837.

Slender upright perennial to 1 m. tall; leaves sessile, subcoriaceous, lanceolate to linear-lanceolate, acute at apex, cuneate at base, with low

teeth or undulate along the margins, the lower leaves 1.0-1.2 cm. broad, the upper much reduced; inflorescence spicate, terminal and occasionally lateral, slender, interrupted, to nearly 30 cm. long; calyx campanulate, 3.5-5.0 mm. long, the lobes at least one-third as long as the tube; corolla 1.2-1.7 cm. long, purplish to rarely white. Range. — Kentucky to Kansas south to Texas and Alabama. Habitat. — Low prairies.

This is our only species with an undulate leaf margin. The drastic reduction in size of the upper leaves recalls *P. virginiana* and *P. angustifolia.*

Fernald (1950) records this species from Illinois, while Gleason (1952) states "reported from Ill." Jones, Fuller, *et al.* (1955) regard these references as errors for *P. virginiana*, but consider that the real *P. intermedia* does not occur in Illinois. A single station for this species in Illinois is the edge of Willow Slough in Adams County.

2. *Physostegia parviflora* Nutt. ex Benth. in DC. Prod. **12**:454. 1825. *Dracocephalum nuttallii* Britt. Ill. Fl. ed. 2. 3:117. 1913.

Erect perennial to a little less than 1 m. tall; leaves sessile, subcoriaceous, broadly lanceolate, acute to acuminate at apex, the upper broadly rounded at base, serrate, the lower 1.5-2.0 cm. broad, the upper gradually reduced; inflorescence spicate, terminal and occasionally lateral, rather thick, densely flowered, to 15 cm. long; calyx campanulate, 4-7 mm. long, the lobes about one-third as long as the tube; corolla 1.0-1.5 cm. long, purplish to whitish. Range. — Minnesota to British Columbia south to Oregon and Illinois. Habitat. — Low prairies.

The broadly rounded bases of the upper leaves are unique among the Illinois species of *Physostegia.* The corolla is the shortest in the genus. The gradual reduction in size of leaves from base to summit of stem is similar to the condition in *P. speciosa.*

Fernald (1950) attributes this species to Illinois, although Gleason (1952), Jones (1945, 1950), and Jones, Fuller, *et al.* (1955) do not record it. Authentic specimens of *P. parviflora* in Illinois herbaria are from Lake and Lee counties.

3. *Physostegia angustifolia* Fern. in Rhodora **45**:462. 1943.

Rather robust erect perennial to nearly 1 m. tall; leaves sessile, subcoriaceous, narrowly lanceolate, acute to acuminate at apex, cuneate at base, serrate, the broadest about 1 cm. wide, the upper abruptly reduced in size; inflorescence spicate, slender, usually solitary, occasionally with lateral branches, remotely flowered, to about 30 cm. long; calyx tubular-campanulate, 4-8 mm. long, the teeth about two-fifths as long as the tube; corolla 2.5-3.0 cm. long, purplish to whitish. Range. — Tennessee to Illinois south to Texas and Mississippi. Habitat. — Low prairies. Fernald (1943) has discussed the naming of this species.

While the general aspect of the plant indicates its relationship with *P. virginiana*, the consistently narrow leaves and the very interrupted inflorescence are sufficient reasons for maintaining this as a distinct species.

The distribution of this species is local throughout the state, except for the southern counties where it is apparently absent.

Distribution. — Calhoun, Cass, Cook, Ford, Greene, Hancock, Henderson, Iroquois, LaSalle, Livingston, McLean, Madison, Marion, Mason, Morgan, Moultrie, Piatt, Pike, Shelby, Tazewell, Vermilion, Wabash, Will.

4. *Physostegia virginiana* (L.) Benth. Lab. Gen. & Sp. 504. 1834.
Dracocephalum virginianum L. Sp. Pl. 594. 1753.
Physostegia virginiana f. *candida* Benke, in Am. Midl. Nat. **16**:423. 1935.

Rather stout perennial to about 1 m. tall; leaves sessile, subcoriaceous, lanceolate, acute at apex, cuneate at base, sharply serrate, the teeth upwardly curved, the lower leaves 1.2-2.2 cm. wide, the upper abruptly reduced, usually entire; inflorescence spicate, usually branched, rather thick, continuous, to 20 cm. long; calyx short-tubular, glandular and puberulent, 5-10 mm. long, the teeth about one-third as long as the tube; corolla 2.2-3.0 cm. long, purple to white. Range. — Maine to Oklahoma south to Texas and Alabama. Habitat. — Low ground, particularly prairies.

Opinion varies concerning the specific limitation of this species. Most botanists segregate *P. speciosa* as a separate species, although Fernald (1950) chooses to consider the latter as a variety.

The chief diagnostic characters for *P. virginiana* are the greatly reduced and usually entire upper leaves and the large and glandular calyx. White-flowered forms have been called f. *candida*.

This species has a general distribution throughout Illinois.

Distribution. — Champaign, Christian, Cook, DeKalb, DuPage, Hancock, Henderson, Henry, Iroquois, Jackson, Jersey, Johnson, Kankakee, Lawrence, Lee, Livingston, Macon, Marion, Mason, Monroe, Pope, Randolph, Richland, St. Clair, Saline, Stark, Union, Vermilion.

5. *Physostegia speciosa* (Sweet) Sweet, Hort. Brit., ed. 2, 406. 1830.
Dracocephalum speciosum Sweet, Brit. Fl. Gard. pl. 93. 1825.
Physostegia formosior Lunell, in Bull. Leeds Herb. **2**:7. 1908.
Dracocephalum formosius (Lunell) Rydb. in Brittonia **1**:95. 1931.

Robust upright perennial to nearly 1 m. tall; leaves sessile, subcoriaceous, lanceolate to oblanceolate, acute at apex, cuneate at base, sharply serrate, the lower leaves 2-3 cm. broad, the upper only gradually reduced; inflorescence spicate, rather stout, terminal and usually lateral, continuous, 15-25 cm. long; calyx campanulate, 4.5-7.0 cm.

long, the lobes about two-fifths as long as the tube, eglandular; corolla 1.5-3.0 cm. long, purplish to rarely white.

Although this species is similar to *P. virginiana*, it may be distinguished by its eglandular calyx and its gradually reduced bracteal leaves. The flowers are generally slightly smaller in *P. speciosa*. Range. — Maine to North Dakota south to Nebraska and North Carolina. Habitat. — Low prairies.

Distribution. — Adams, Boone, Brown, Champaign, Cook, DeWitt, Greene, Henry, Jackson, Jersey, JoDaviess, Kankakee, Lake, LaSalle, Lawrence, Lee, McHenry, Macon, Marshall, Mason, Ogle, Peoria, Piatt, Pike, Putnam, Rock Island, Sangamon, Tazewell, Union, Vermilion, Wabash, Warren, Winnebago, Woodford.

DEPARTMENT OF BOTANY, SOUTHERN ILLINOIS UNIVERSITY,
CARBONDALE, ILLINOIS.

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LINNAEUS, C. 1753. Species Plantarum.

THE INTEGRADATION OF SENECIO PLATTENSIS AND SENECIO PAUPERCULUS IN WISCONSIN[1]

T. M. BARKLEY

Dr. Hugh Iltis of the University of Wisconsin recently invited me to contribute *Senecio* to his *Flora of Wisconsin* project. Preparation of the treatment has focused attention on the intergradation of *S. plattensis* Nutt. with *S. pauperculus* Michx. var. *pauperculus*, (hereafter referred to as *S. pauperculus*) and the related difficulty in delimiting the two taxa. The problem of species delimitation in *Senecio* is treated generally in my revision of *S. aureus* L. and allied species (in press). This paper, however, will serve to discuss a specific instance and its taxonomic implications.

Senecio plattensis and *S. pauperculus* are fairly distinct taxa, each with its own range and ecological requirements. However, where the ranges and habitats overlap, the two taxa intergrade morphologically. The greatest extent of intergradation is in the upper Mississippi Valley from northern Missouri through eastern Iowa to Wisconsin and Minnesota.

Typical *S. plattensis* is distinguished by its persistent pubescence, its single-stemmed growth habit, its short erect caudex, its well developed pinnatifid lower cauline leaves, and its relatively compact inflorescence. It is fundamentally a plant of the prairies and plains of central North America. It also occurs in relict prairie areas in localities disjunct from the main distribution.

Biologically typical *S. pauperculus* is distinguished by being glabrous or nearly so at maturity, by its frequent production of several loosely clustered stems, its short but often horizontal, branching caudex, its reduced cauline leaves and its generally loose inflorescence. It grows primarily in boreal woodlands, meadows, and open areas in woodland associations.

[1]Supported in part by a grant from the Kansas State University Bureau of General Research.

Each taxon is further distinguished by a series of more or less intangible features which collectively give it a characteristic gross aspect.

In Wisconsin, typical *S. plattensis* is most abundant in the southwestern half of the state, i.e., in the areas primarily of gray-brown podzol soils. *S. pauperculus* occurs throughout the state, but it is most abundant and "most typical" in the northern half, in the areas of true podzol soils, (cf. soil map in U. S. Dept. Agr. Yearbook, 1938).

Populations occur throughout Wisconsin which are more or less intermediate between *S. plattensis* and *S. pauperculus*. These intermediate populations are most frequent in and near northern Washburn county in northwestern Wisconsin, and in Dane, Iowa, Green, and Rock counties at the southern edge of the state. The intermediates commonly resemble either *S. plattensis* or *S. pauperculus* rather closely, but they have conspicuous tendencies toward the other taxon. Two frequent "intermediates" in Wisconsin are: (a) otherwise typical *S. pauperculus*, but with light, persistent tomentum, and (b) fairly typical *S. plattensis* but with strongly reduced cauline leaves and a branching caudex. Plants which are exactly midway between the two taxa are rather uncommon.

In North America the genus *Senecio* appears to be composed of numerous more or less discrete taxa which have broad but definite natural ranges. These intergrade morphologically with related taxa wherever their ranges and habitats overlap. It is one thing to recognize the biological patterns within the genus, but quite another to reflect these patterns in the taxonomic system. If there were no senecios other than *S. plattensis* and *S. pauperculus*, the taxonomic treatment could be simple; the two entities could be recognized as infraspecific taxa of one species. However, in other localities, both *S. plattensis* and *S. pauperculus* intergrade just as completely with other taxa as they do with each other in the upper Mississippi Valley. *S. plattensis*, for example, intergrades with both *S. obovatus* Muhl. ex Willd. and *S. tomentosus* Michx., while *S. pauperculus* intergrades with *S. streptanthifolius* Greene and *S. smallii* Britt.

Combining *S. plattensis* and *S. pauperculus* into a single species could not stop there; it would be necessary to include *S. obovatus, S. tomentosus, S. smallii,* and *S. streptanthifolius,* plus the other taxa with which these in turn intergrade. Continued combining of all the entities which intergrade through *S. streptanthifolius* would be an almost limitless process, eventually taking much of what is included in Rydberg's sections *Aurei, Lobati,* and *Tomentosi.* The one resulting species would contain so many and such diverse entities, and would encompass so much variation as to be ridiculous. Therefore, *S. plattensis* and *S. pauperculus* are recognized as separate species.

The necessity for maintaining these entities as species becomes apparent only when all of the related senecios are considered. This is of small consolation to the floristic botanist working in the upper Mississippi Valley area, and one can sympathize with Davidson, who reduced *S. plattensis* to *S. pauperculus* in his flora of southeastern Iowa (1959).

— DEPARTMENT OF BOTANY, KANSAS STATE UNIVERSITY, MANHATTAN, KANSAS.

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